Practitioner's Docket No. 908.199 **PATENT**

Preliminary Classification:

Proposed Class:

Subclass:

NOTE: "All applicants are requested to include a preliminary classification on newly filed patent applications. The preliminary classification, preferably class and subclass designations, should be identified in the upper right-hand corner of the letter of transmittal accompanying the application papers, for example 'Proposed Class 2, subclass 129.'" M.P.E.P. § 601, 7th ed.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Box Patent Application
Assistant Commissioner for Patents
Washington, D.C. 20231

NEW APPLICATION TRANSMITTAL

Transmitted herewith for filing is the patent application of

Inventor(s): Robert W. Greer IV

WARNING: *37 C.F.R. § 1.41(a)(1) points out:*

"(a) A patent is applied for in the name or names of the actual inventor or inventors.

"(1) The inventorship of a nonprovisional application is that inventorship set forth in the oath or declaration as prescribed by § 1.63, except as provided for in § 1.53(d)(4) and § 1.63(d). If an oath or declaration as prescribed by § 1.63 is not filed during the pendency of a nonprovisional application, the inventorship is that inventorship set forth in the application papers filed pursuant to § 1.53(b), unless a petition under this paragraph accompanied by the fee set forth in § 1.17(i) is filed supplying or changing the name or names of the inventor or inventors."

For (title): COLORED RADIATION CURABLE COATING COMPOSITIONS FOR IDENTIFYING TELECOMMUNICATIONS ELEMENTS AND TELECOMMUNICATIONS ELEMENTS COATED THEREBY

CERTIFICATION UNDER 37 C.F.R. § 1.10*
(Express Mail label number is mandatory.)
(Express Mail certification is optional.)

I hereby certify that this New Application Transmittal and the documents referred to as attached therein are being deposited with the United States Postal Service on this date July 27, 1999, in an envelope as "Express Mail Post Office to Addressee," mailing Label Number EM173440315US, addressed to the: Assistant Commissioner for Patents, Washington, D.C. 20231.

Judith Schick
(type or print name of person mailing paper)

Judith Schick
Signature of person mailing paper

WARNING: *Certificate of mailing (first class) or facsimile transmission procedures of 37 C.F.R. § 1.8 cannot be used to obtain a date of mailing or transmission for this correspondence.*

"WARNING: *Each paper or fee filed by "Express Mail" **must** have the number of the "Express Mail" mailing label placed thereon prior to mailing. 37 C.F.R. § 1.10(b).*
*"Since the filing of correspondence under § 1.10 without the Express Mail mailing label thereon is an oversight that can be avoided by the exercise of reasonable care, requests for waiver of this requirement will **not** be granted on petition." Notice of Oct. 24, 1996, 60 Fed. Reg. 56,439, at 56,442.*

1. Type of Application

This new application is for a(n)

(check one applicable item below)

☒ Original (nonprovisional)

☐ Design

☐ Plant

WARNING: ***Do not*** *use this transmittal for a completion in the U.S. of an International Application under 35 U.S.C. § 371(c)(4), unless the International Application is being filed as a divisional, continuation or continuation-in-part application.*

WARNING: ***Do not*** *use this transmittal for the filing of a provisional application.*

NOTE: If one of the following 3 items apply, then complete and attach ADDED PAGES FOR NEW APPLICATION TRANSMITTAL WHERE BENEFIT OF A PRIOR U.S. APPLICATION CLAIMED and a NOTIFICATION IN PARENT APPLICATION OF THE FILING OF THIS CONTINUATION APPLICATION.

☐ Divisional.

☐ Continuation.

☐ Continuation-in-part (C-I-P).

2. Benefit of Prior U.S. Application(s) (35 U.S.C. §§ 119(e), 120, or 121)

NOTE: A nonprovisional application may claim an invention disclosed in one or more prior filed copending nonprovisional applications or copending international applications designating the United States of America. In order for a nonprovisional application to claim the benefit of a prior filed copending nonprovisional application or copending international application designating the United States of America, each prior application must name as an inventor at least one inventor named in the later filed nonprovisional application and disclose the named inventor's invention claimed in at least one claim of the later filed nonprovisional application in the manner provided by the first paragraph of 35 U.S.C. § 112. Each prior application must also be:

(i) An international application entitled to a filing date in accordance with PCT Article 11 and designating the United States of America; or

(ii) Complete as set forth in § 1.51(b); or

(iii) Entitled to a filing date as set forth in § 1.53(b) or § 1.53(d) and include the basic filing fee set forth in § 1.16; or

(iv) Entitled to a filing date as set forth in § 1.53(b) and have paid therein the processing and retention fee set forth in § 1.21(l) within the time period set forth in § 1.53(f).

37 C.F.R. § 1.78(a)(1).

NOTE: If the new application being transmitted is a divisional, continuation or a continuation-in-part of a parent case, or where the parent case is an International Application which designated the U.S., or benefit of a prior provisional application is claimed, then check the following item and complete and attach ADDED PAGES FOR NEW APPLICATION TRANSMITTAL WHERE BENEFIT OF PRIOR U.S. APPLICATION(S) CLAIMED.

WARNING: *If an application claims the benefit of the filing date of an earlier filed application under 35 U.S.C. §§ 120, 121 or 365(c), the 20-year term of that application will be based upon the filing date of the earliest U.S. application that the application makes reference to under 35 U.S.C. §§ 120, 121 or 365(c). (35 U.S.C. § 154(a)(2) does not take into account, for the determination of the patent term, any application on which priority is claimed under 35 U.S.C. §§ 119, 365(a) or 365(b).) For a c-i-p application, applicant should review whether any claim in the patent that will issue is supported by an earlier application and, if not, the applicant should consider canceling the reference to the earlier filed application. The term of a patent is not based on a claim-by-claim approach. See Notice of April 14, 1995, 60 Fed. Reg. 20,195, at 20,205.*

WARNING: *When the last day of pendency of a provisional application falls on a Saturday, Sunday, or Federal holiday within the District of Columbia, any nonprovisional application claiming benefit of the provisional application* ***must*** *be filed prior to the Saturday, Sunday, or Federal holiday within the District of Columbia. See 37 C.F.R. § 1.78(a)(3).*

☐ The new application being transmitted claims the benefit of prior U.S. application(s). Enclosed are ADDED PAGES FOR NEW APPLICATION TRANSMITTAL WHERE BENEFIT OF PRIOR U.S. APPLICATION(S) CLAIMED.

3. Papers Enclosed

A. Required for filing date under 37 C.F.R. § 1.53(b) (Regular) or 37 C.F.R. § 1.153 (Design) Application

15 Pages of specification

4 Pages of claims

1 Sheets of drawing

WARNING: ***DO NOT*** *submit original drawings. A high quality copy of the drawings should be supplied when filing a patent application. The drawings that are submitted to the Office must be on strong, white, smooth, and non-shiny paper and meet the standards according to § 1.84. If corrections to the drawings are necessary, they should be made to the original drawing and a high-quality copy of the corrected original drawing then submitted to the Office. Only one copy is required or desired. For comments on proposed then-new 37 C.F.R. § 1.84, see Notice of March 9, 1988 (1990 O.G. 57-62).*

NOTE: "Identifying indicia, if provided, should include the application number or the title of the invention, inventor's name, docket number (if any), and the name and telephone number of a person to call if the Office is unable to match the drawings to the proper application. This information should be placed on the back of each sheet of drawing a minimum distance of 1.5 cm. (5/8 inch) down from the top of the page . . ." 37 C.F.R. § 1.84(c)).

(complete the following, if applicable)

☐ The enclosed drawing(s) are photograph(s), and there is also attached a "PETITION TO ACCEPT PHOTOGRAPH(S) AS DRAWING(S)." 37 C.F.R. § 1.84(b).

☐ formal

☒ informal

B. Other Papers Enclosed

0 Pages of declaration and power of attorney

1 Pages of abstract

1 Other (title page)

4. Additional papers enclosed

☐ Amendment to claims

☐ Cancel in this applications claims _____ before calculating the filing fee. (At least one original Independent claim must be retained for filing purposes.)

☐ Add the claims shown on the attached amendment. (Claims added have been numbered consecutively following the highest numbered original claims.)

☐ Preliminary Amendment

☐ Information Disclosure Statement (37 C.F.R. § 1.98)

☐ Form PTO–1449 (PTO/SB/08A and 08B)

☐ Citations

- ☐ Declaration of Biological Deposit
- ☐ Submission of "Sequence Listing," computer readable copy and/or amendment pertaining thereto for biotechnology invention containing nucleotide and/or amino acid sequence.
- ☐ Authorization of Attorney(s) to Accept and Follow Instructions from Representative
- ☐ Special Comments
- ☐ Other

5. Declaration or oath (including power of attorney)

NOTE: A newly executed declaration is not required in a continuation or divisional application provided that the prior nonprovisional application contained a declaration as required, the application being filed is by all or fewer than all the inventors named in the prior application, there is no new matter in the application being filed, and a copy of the executed declaration filed in the prior application (showing the signature or an indication thereon that it was signed) is submitted. The copy must be accompanied by a statement requesting deletion of the names of person(s) who are not inventors of the application being filed. If the declaration in the prior application was filed under § 1.47, then a copy of that declaration must be filed accompanied by a copy of the decision granting § 1.47 status or, if a nonsigning person under § 1.47 has subsequently joined in a prior application, then a copy of the subsequently executed declaration must be filed. See 37 C.F.R. §§ 1.63(d)(1)-(3).

NOTE: A declaration filed to complete an application must be executed, identify the specification to which it is directed, identify each inventor by full name including family name and at least one given name, without abbreviation together with any other given name or initial, and the residence, post office address and country or citizenship of each inventor, and state whether the inventor is a sole or joint inventor. 37 C.F.R. § 1.63(a)(1)-(4).

☐ Enclosed

Executed by

(check **all** *applicable boxes)*

- ☐ inventor(s).
- ☐ legal representative of inventor(s). 37 C.F.R. §§ 1.42 or 1.43.
- ☐ joint inventor or person showing a proprietary interest on behalf of inventor who refused to sign or cannot be reached.
  - ☐ This is the petition required by 37 C.F.R. § 1.47 and the statement required by 37 C.F.R. § 1.47 is also attached. See item 13 below for fee.

☒ Not Enclosed.

NOTE: Where the filing is a completion in the U.S. of an International Application or where the completion of the U.S. application contains subject matter in addition to the International Application, the application may be treated as a continuation or continuation-in-part, as the case may be, utilizing ADDED PAGE FOR NEW APPLICATION TRANSMITTAL WHERE BENEFIT OF PRIOR U.S. APPLICATION CLAIMED.

- ☐ Application is made by a person authorized under 37 C.F.R. § 1.41(c) on behalf of *all* the above named inventor(s).

(The declaration or oath, along with the surcharge required by 37 C.F.R. § 1.16(e) can be filed subsequently).

- ☐ Showing that the filing is authorized. *(not required unless called into question. 37 C.F.R. § 1.41(d))*

6. Inventorship Statement

WARNING: *If the named inventors are each not the inventors of all the claims an explanation, including the ownership of the various claims at the time the last claimed invention was made, should be submitted.*

The inventorship for all the claims in this application are:

☒ The same.

or

☐ Not the same. An explanation, including the ownership of the various claims at the time the last claimed invention was made,

☐ is submitted.

☐ will be submitted.

7. Language

NOTE: An application including a signed oath or declaration may be filed in a language other than English. An English translation of the non-English language application and the processing fee of $130.00 required by 37 C.F.R. § 1.17(k) is required to be filed with the application, or within such time as may be set by the Office. 37 C.F.R. § 1.52(d).

☒ English

☐ Non-English

☐ The attached translation includes a statement that the translation is accurate. 37 C.F.R. § 1.52(d).

8. Assignment

☒ An assignment of the invention to Alcatel

☐ is attached. A separate ☐ "COVER SHEET FOR ASSIGNMENT (DOCUMENT) ACCOMPANYING NEW PATENT APPLICATION" or ☐ FORM PTO 1595 is also attached.

☒ will follow.

NOTE: "If an assignment is submitted with a new application, send two separate letters-one for the application and one for the assignment." Notice of May 4, 1990 (1114 O.G. 77-78).

WARNING: *A newly executed "CERTIFICATE UNDER 37 C.F.R. § 3.73(b)" must be filed when a continuation-in-part application is filed by an assignee. Notice of April 30, 1993, 1150 O.G. 62-64.*

9. Certified Copy

Certified copy(ies) of application(s)

Country	Appln. No.	Filed
Country	Appln. No.	Filed
Country	Appln. No.	Filed

from which priority is claimed

☐ is (are) attached.

☐ will follow.

NOTE: The foreign application forming the basis for the claim for priority must be referred to in the oath or declaration. 37 C.F.R. § 1.55(a) and 1.63.

NOTE: This item is for any foreign priority for which the application being filed directly relates. If any parent U.S. application or International Application from which this application claims benefit under 35 U.S.C. § 120 is itself entitled to priority from a prior foreign application, then complete item 18 on the ADDED PAGES FOR NEW APPLICATION TRANSMITTAL WHERE BENEFIT OF PRIOR U.S. APPLICATION(S) CLAIMED.

10. Fee Calculation (37 C.F.R. § 1.16)

A. ☒ Regular application

CLAIMS AS FILED					
Number filed		Number Extra		Rate	Basic Fee 37 C.F.R. § 1.16(a) $760.00
Total Claims (37 C.F.R. § 1.16(c))	24 − 20 =	4	×	$ 18.00	72.00
Independent Claims (37 C.F.R. § 1.16(b))	3 − 3 =	0	×	$ 78.00	0.00
Multiple dependent claim(s), if any (37 C.F.R. § 1.16(d))		0	+	$260.00	

☐ Amendment cancelling extra claims is enclosed.

☐ Amendment deleting multiple-dependencies is enclosed.

☒ Fee for extra claims is not being paid at this time.

NOTE: If the fees for extra claims are not paid on filing they must be paid or the claims cancelled by amendment, prior to the expiration of the time period set for response by the Patent and Trademark Office in any notice of fee deficiency. 37 C.F.R. § 1.16(d).

Filing Fee Calculation $ 832.00

B. ☐ Design application ($310.00—37 C.F.R. § 1.16(f))

Filing Fee Calculation $_____

C. ☐ Plant application ($480.00—37 C.F.R. § 1.16(g))

Filing fee calculation $_____

11. Small Entity Statement(s)

☐ Statement(s) that this is a filing by a small entity under 37 C.F.R. § 1.9 and 1.27 is (are) attached.

WARNING: *"Status as a small entity must be specifically established in each application or patent in which the status is available and desired. Status as a small entity in one application or patent does not affect any other application or patent, including applications or patents which are directly or indirectly dependent upon the application or patent in which the status has been established. The refiling of an application under § 1.53 as a continuation, division, or continuation-in-part (including a continued prosecution application under § 1.53(d)), or the filing of a reissue application requires a new determination as to continued entitlement to small entity status for the continuing or reissue application. A nonprovisional application claiming benefit under 35 U.S.C. § 119(e), 120, 121, or 365(c) of a prior application, or a reissue application may rely on a statement filed in the prior application or in the patent if the nonprovisional application or the reissue application includes a reference to the statement in the prior application or in the patent or includes a copy of the statement in the prior application or in the patent and status as a small entity is still proper and desired. The payment of the small entity basic statutory filing fee will be treated as such a reference for purposes of this section." 37 C.F.R. § 1.28(a)(2).*

WARNING: *"Small entity status must not be established when the person or persons signing the . . . statement can* ***unequivocally*** *make the required self-certification." M.P.E.P., § 509.03, 6th ed., rev. 2, July 1996 (emphasis added).*

(complete the following, if applicable)

☐ Status as a small entity was claimed in prior application

_____ / _____, filed on _____, from which benefit is being claimed for this application under:

35 U.S.C. § ☐ 119(e),
☐ 120,
☐ 121,
☐ 365(c),

and which status as a small entity is still proper and desired.

☐ A copy of the statement in the prior application is included.

Filing Fee Calculation (50% of **A, B** or **C** above)

$_____

NOTE: Any excess of the full fee paid will be refunded if small entitiy status is established and a refund request are filed within 2 months of the date of timely payment of a full fee. The two-month period is not extendable under § 1.136. 37 C.F.R. § 1.28(a).

12. Request for International-Type Search (37 C.F.R. § 1.104(d))

(complete, if applicable)

☐ Please prepare an international-type search report for this application at the time when national examination on the merits takes place.

13. Fee Payment Being Made at This Time

☒ Not Enclosed

☒ No filing fee is to be paid at this time.
(This and the surcharge required by 37 C.F.R. § 1.16(e) can be paid subsequently.)

☐ Enclosed

☐ Filing fee $ _____

☐ Recording assignment
($40.00; 37 C.F.R. § 1.21(h))
(See attached "COVER SHEET FOR ASSIGNMENT ACCOMPANYING NEW APPLICATION".) $ _____

☐ Petition fee for filing by other than all the inventors or person on behalf of the inventor where inventor refused to sign or cannot be reached
($130.00; 37 C.F.R. §§ 1.47 and 1.17(i)) $ _____

☐ For processing an application with a specification in
a non-English language
($130.00; 37 C.F.R. §§ 1.52(d) and 1.17(k)) $ _____

☐ Processing and retention fee
($130.00; 37 C.F.R. §§ 1.53(d) and 1.21(l)) $ _____

☐ Fee for international-type search report
($40.00; 37 C.F.R. § 1.21(e)) $ _____

NOTE: 37 C.F.R. § 1.21(l) establishes a fee for processing and retaining any application that is abandoned for failing to complete the application pursuant to 37 C.F.R. § 1.53(f) and this, as well as the changes to 37 C.F.R. §§ 1.53 and 1.78(a)(1), indicate that in order to obtain the benefit of a prior U.S. application, either the basic filing fee must be paid, or the processing and retention fee of § 1.21(l) must be paid, within 1 year from notification under § 53(f).

Total fees enclosed $_____

14. Method of Payment of Fees

☐ Check in the amount of $_____

☐ Charge Account No. _____ in the amount of $_____.

A duplicate of this transmittal is attached.

NOTE: Fees should be itemized in such a manner that it is clear for which purpose the fees are paid. 37 C.F.R. § 1.22(b).

15. Authorization to Charge Additional Fees

WARNING: *If no fees are to be paid on filing, the following items should not be completed.*

WARNING: *Accurately count claims, especially multiple dependent claims, to avoid unexpected high charges, if extra claim charges are authorized.*

☐ The Commissioner is hereby authorized to charge the following additional fees by this paper and during the entire pendency of this application to Account No. _____:

☐ 37 C.F.R. § 1.16(a), (f) or (g) (filing fees)

☐ 37 C.F.R. § 1.16(b), (c) and (d) (presentation of extra claims)

NOTE: Because additional fees for excess or multiple dependent claims not paid on filing or on later presentation must only be paid or these claims cancelled by amendment prior to the expiration of the time period set for response by the PTO in any notice of fee deficiency (37 C.F.R. § 1.16(d)), it might be best not to authorize the PTO to charge additional claim fees, except possibly when dealing with amendments after final action.

☐ 37 C.F.R. § 1.16(e) (surcharge for filing the basic filing fee and/or declaration on a date later than the filing date of the application)

☐ 37 C.F.R. § 1.17(a)(1)–(5) (extension fees pursuant to § 1.136(a)).

☐ 37 C.F.R. § 1.17 (application processing fees)

NOTE: ". . .A written request may be submitted in an application that is an authorization to treat any concurrent or future reply, requiring a petition for an extension of time under this paragraph for its timely submission, as incorporating a petition for extension of time for the appropriate length of time. An authorization to charge all required fees, fees under § 1.17, or all required extension of time fees will be treated as a constructive petition for an extension of time in any concurrent or future reply requiring a petition for an extension of time under this paragraph for its timely submission. Submission of the fee set forth in § 1.17(a) will also be treated as a constructive petition for an extension of time in any concurrent reply requiring a petition for an extension of time under this paragraph for its timely submission." 37 C.F.R. § 1.136(a)(3).

☐ 37 C.F.R. § 1.18 (issue fee at or before mailing of Notice of Allowance, pursuant to 37 C.F.R. § 1.311(b))

NOTE: Where an authorization to charge the issue fee to a deposit account has been filed before the mailing of a Notice of Allowance, the issue fee will be automatically charged to the deposit account at the time of mailing the notice of allowance. 37 C.F.R. § 1.311(b).

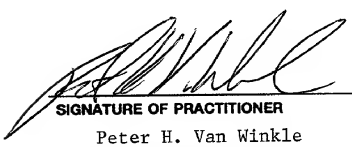
NOTE: 37 C.F.R. § 1.28(b) requires "Notification of any change in status resulting in loss of entitlement to small entity status must be filed in the application . . . prior to paying, or at the time of paying, . . . the issue fee. . . " From the wording of 37 C.F.R. § 1.28(b), (a) notification of change of status must be made even if the fee is paid as "other than a small entity" and (b) no notification is required if the change is to another small entity.

16. Instructions as to Overpayment

NOTE: ". . . Amounts of twenty-five dollars or less will not be returned unless specifically requested within a reasonable time, nor will the payer be notified of such amounts; amounts over twenty-five dollars may be returned by check or, if requested, by credit to a deposit account." 37 C.F.R. § 1.26(a).

☐ Credit Account No. _____

☐ Refund



SIGNATURE OF PRACTITIONER

Reg. No. 36,039

Peter H. Van Winkle

(type or print name of attorney)

Tel. No. (203) 261-1234

Ware, Fressola, Van Der Sluys & Adolphson LLP

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Customer No. 004955

☐ **Incorporation by reference of added pages**

(check the following item if the application in this transmittal claims the benefit of prior U.S. application(s) (including an international application entering the U.S. stage as a continuation, divisional or C-I-P application) and complete and attach the ADDED PAGES FOR NEW APPLICATION TRANSMITTAL WHERE BENEFIT OF PRIOR U.S. APPLICATION(S) CLAIMED)

☐ Plus Added Pages for New Application Transmittal Where Benefit of Prior U.S. Application(s) Claimed

Number of pages added _____

☐ Plus Added Pages for Papers Referred to in Item 4 Above

Number of pages added _____

☐ Plus added pages deleting names of inventor(s) named in prior application(s) who is/are no longer inventor(s) of the subject matter claimed in this application.

Number of pages added _____

☐ Plus "Assignment Cover Letter Accompanying New Application"

Number of pages added _____

☒ **Statement Where No Further Pages Added**

(if no further pages form a part of this Transmittal, then end this Transmittal with this page and check the following item)

☒ This transmittal ends with this page.

PATENT
Attorney Docket No. 908.199

U.S. Patent Application of

Robert W. Greer IV

relating to

COLORED RADIATION CURABLE COATING COMPOSITIONS FOR IDENTIFYING TELECOMMUNICATIONS ELEMENTS AND TELECOMMUNICATIONS ELEMENTS COATED THEREBY

CERTIFICATE OF MAILING UNDER 37 CFR 1.10

I hereby certify that this correspondence is being deposited with the United States Postal Service on this date, July 27, 1999, in an envelope marked as "Express Mail Post Office to Addressee," Mailing Label Number EM173440315US, addressed to the Assistant Commissioner for Patents, Washington, DC 20231.

Judith Schick

Judith Schick

COLORED RADIATION CURABLE COATING COMPOSITIONS FOR IDENTIFYING TELECOMMUNICATIONS ELEMENTS AND TELECOMMUNICATIONS ELEMENTS COATED THEREBY

BACKGROUND OF THE INVENTION

Field of the Invention

The present invention generally relates to radiation curable coatings for telecommunications elements such as optical fibers and optical fiber ribbons. More particularly, the present invention relates to colored radiation curable coating compositions for producing cured coatings on the telecommunications element having an identifying color provided by dye molecules which are covalently bonded to the cured coating.

Description of Related Art

For many years now, optical fibers have been used as a reliable transmission medium in telecommunications cables. Typically, an optical fiber comprises a core, a cladding and one or more coatings applied over the cladding. One purpose of the coatings is to protect the surface of the optical fiber from mechanical scratches and abrasions typically caused by subsequent handling and use. Another purpose of the coatings is to protect the glass from exposure to moisture. The coating or coatings may also have some influence over the fiber's optical characteristics because the coatings are physically responsive to external mechanical forces and temperature. The coating compositions applied to the optical fiber are typically liquid, radiation curable compositions. Typically, the coating compositions are cured on the optical fiber by exposing the coating composition to ultraviolet radiation, electron beam radiation or ionizing radiation for a predetermined period of time deemed suitable for effective curing.

Telecommunications cables containing optical fibers come in a variety of configurations. In some cables, the optical fibers are held loosely inside a buffer

tube. In other cables, the optical fibers are arranged in a planar array to form an optical fiber ribbon. The planar array is typically encapsulated by one or more radiation curable matrix material layers. The radiation curable matrix layers are cured by exposing the matrix material to ultraviolet radiation, electron beam radiation, ionizing radiation or infrared radiation for a predetermined period of time deemed suitable for effective curing.

In a telecommunications cable containing multiple optical fibers, the optical fibers may be distinguished from each other by the use of a color coating layer which has been applied over a coated optical fiber. Colors in the color coating layer are usually obtained by dispersing colored pigment particles in a suitable liquid carrier and applying the liquid carrier over the coating. Unfortunately, the use of pigment particles to provide color in color coatings for optical fibers has presented manufacturing and performance problems. For example, the pigment particles and the liquid carrier tend to gradually separate into two distinct phases. As a result, pigmented color coatings have a relatively short shelf life. In addition, the phase separation in a pigmented coloring system is further complicated by concurrent agglomeration of pigment particles. Undesirably, the presence of pigment particle agglomerates in a color coating on a coated optical fiber can induce micro-bending which results in transmission losses. Typically, a relatively high concentration of pigment material is required to achieve an opaque ultraviolet radiation curable color coating. Unfortunately, the required high concentration inhibits the transmission of incident ultraviolet radiation which is necessary to cure the color coating material because the pigments refract, reflect and scatter the incident radiation. The inhibition of the ultraviolet radiation results in a reduction in processing speed of the optical fiber along a manufacturing line and thereby increases production costs. Also, the slow cure speed of pigmented color coatings causes the processing and the cure of these materials to be sensitive to minor changes in the thickness of the color coatings.

The use of dyes to provide color in color coatings has been considered as an alternative to pigment-based color coatings. Dyes have the advantage over pigments of faster curing because the dyes do not scatter the curing radiation, although some dyes may absorb light which could slow curing. However, dyes are generally not preferred because they diffuse (bleed) out into common cable filling compounds resulting in a color loss. In an effort to reduce the bleeding, U.S. Patent No. 5,074,643 teaches the use of a polymeric dye in a color coating. The polymeric dyes are macromolecular chromophore containing molecules which are entrapped in the cross linked coating network. While the entrapment results in a slowing of the bleeding process, the dyes nevertheless still bleed. Over time, even with the entrapped polymeric dyes, the color imparted to the fibers is likely to be lost and if the color is lost from the fibers, then identification of each of the fibers becomes extremely difficult and time consuming in the field during fiber splicing.

If a telecommunications cable has many optical fiber ribbons, it is generally desirable to distinguish one optical fiber ribbon from another by coloring each of the optical fiber ribbons. Typically, color in a colored optical fiber ribbons is obtained in the same way as color is obtained in a color coated optical fiber. Either the optical fiber ribbon matrix composition is provided with pigments or a polymer dye is used. The same problems mentioned above with respect to colored optical fibers apply to colored optical fiber ribbons.

It is desirable to provide a durable color coating for a telecommunication element, such as an optical fiber, that can withstand the conditions in a typical operational environment that such elements are typically found. The present invention endeavors to provide such a durable coating.

SUMMARY OF THE INVENTION

It is an object of the present invention to provide a colored, radiation curable composition for providing a durable color identifying coating on a transmission medium of a telecommunication element such as an optical fiber.

It is another object of the present invention to provide a telecommunication element which has a color identifying coating whose color does not bleed in the presence of typical cable filing compounds.

It is yet another object of the present invention to provide an optical fiber ribbon having a colored matrix whose color does not bleed in the presence of typical cable filing compounds.

It is one aspect of the present invention to meet the foregoing objectives by providing a telecommunication element having a color identifying coating thereon. The telecommunication element comprises at least one elongated communication transmission medium, and a radiation cured polymeric coating having an identifying color applied on at least a portion of the transmission medium, wherein the identifying color in the polymeric coating is provided by chromophore molecules covalently bonded thereto.

It is another aspect of the present invention to meet the foregoing objectives by providing a colored, radiation curable coating composition for providing a telecommunication element with a color identifying polymeric coating having chromophore molecules covalently bonded thereto. The coating composition comprises a radiation curable composition capable of forming a polymeric coating, and a colored oligomer having chromophore molecules covalently bonded thereto and wherein the colored oligomer is capable of covalent bonding with the radiation curable composition.

It is yet another aspect of the present invention to meet the foregoing objectives by providing a method for producing a color identifying polymeric coating having chromophore molecules covalently bonded thereto on at least a portion of a transmission medium of a telecommunication element. The method

comprises the steps of: providing a transmission medium; providing a colored, radiation curable coating composition comprising a radiation curable composition capable of forming a polymeric coating and a colored oligomer having chromophore molecules covalently bonded thereto and wherein the colored oligomer is capable of covalent bonding with the radiation curable composition; applying the coating composition to at least a portion of the transmission medium; and exposing the applied coating composition for a suitable period of time to radiation of a suitable wavelength and intensity to cause curing of the coating composition into the color identifying polymeric coating.

The invention will be more fully understood when reference is made to the following detailed description taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

The drawings, not drawn to scale, include:

FIG. 1A, which is a cross-sectional view of an optical fiber coated with a primary and secondary coatings;

FIG. 1B, which is a cross-sectional view of an optical fiber coated with primary, secondary and tertiary coatings; and

FIG. 2, which is a cross-sectional view of a splittable optical fiber ribbon containing at least one colored matrix.

DETAILED DESCRIPTION OF THE PRESENT INVENTION

Color Coated Optical Fibers

Typical telecommunications elements include an elongated transmission medium such as a metallic wire or an optical fiber. Referring to FIG. 1A, a typical optical fiber **10** transmission medium is shown. The typical optical fiber **10** is formed by a glass core **12** which is surrounded by a glass cladding **14**. The glass cladding **14** of the optical fiber **10** is usually surrounded by one or more

protective polymeric coatings. For example, as shown in FIG. 1A, an inner protective polymeric coating **16** covers at least a portion of the cladding **14** and an outer protective polymeric coating **18** typically covers at least a portion of the inner coating **16**. The inner **16** and outer **18** protective coatings may also be referred to as inner primary and outer primary coatings or primary and secondary coatings. The inner coating **16** is usually obtained by applying a radiation curable (polymerizable) composition capable of forming a polymeric coating upon curing over the cladding **14**. The radiation curable composition is normally applied by passing the optical fiber through a first die or a coating applicator using techniques well known in the art, and therefore, not described herein. Once the radiation curable composition is applied over the cladding **14**, the composition may be cured by exposing it to radiation, such as ultraviolet radiation, electron beam radiation or ionizing radiation, to initiate curing (polymerization) thereof. Ultraviolet radiation is most commonly used. The application and curing of the radiation curable composition to form the inner coating **16** may be followed by the application and curing of another radiation curable composition capable of forming a polymeric coating which forms the outer coating **18**. This sequence is known as a wet-on-dry application of the outer coating **18**. Alternatively, the application of the radiation curable composition which forms the inner coating **16** may be directly followed by the application of a radiation curable composition forming the outer coating **18** prior to exposure to the curing radiation. This is known in the art as a wet-on-wet application. Each application technique is well known in the art.

A typical radiation curable composition capable of forming a polymeric coating for the inner **16** and outer **18** coatings usually includes an acrylated urethane oligomer, which is a reaction product of a hydrocarbon polyol, an aliphatic polyisocyanate and an endcapping monomer such as a hydroxyalkylacrylate or a hydroxyalkylmethacrylate. These typically have monofunctionality, difunctionality or trifunctionality. Other materials, such as photo-initiators, reactive diluents and organofunctional silane adhesion promoters

may be included in the radiation curable composition to tailor the physical properties of the coating to meet specific end-use application requirements, such as to provide good thermal, oxidative and hydrolytic stability as well as a soft, compliant, low glass transition temperature-type coating. A discussion of radiation curable primary and secondary coating compositions may be found in U.S. Patent No. 5,146,531, which is incorporated in its entirety herein by reference.

According to the present invention, the uncolored radiation curable composition that is applied over the cladding and cured to form the inner coating **16** may be colored, if desired, by adding to the composition colored radiation curable oligomers containing chromophore molecules that are covalently bonded thereto. Typical chromophore molecules include anthraquinones, methiones and azo compounds which can provide the three primary colors (blue, yellow and red). The covalent bonding of the chromophore molecules to radiation curable oligomers may be obtained by reacting functional or reactive dyes having the chromophore molecules covalently bonded thereto with the uncolored radiation curable composition. The colored radiation curable oligomers generally have end groups or side groups that make them radiation curable and capable of covalent bonding with other oligomers. When exposed to radiation, these groups covalently bond with other similar groups in the radiation curable composition. For example, the radiation curable composition may have acrylate groups, vinyl groups or epoxy groups. The dye may be functionalized with any end group that may be reacted to covalently bond with another molecule or series of molecules in the radiation curable composition that eventually incorporate the above mentioned radiation curable end group or side group. The functional dye could be a polyol having hydroxy functionality containing a covalently bonded chromophore molecule or the functional dye may have ester or carboxy functionality in addition to the hydroxy functionality described above. Thus, by reacting the reactive or functional dye, containing the covalently bonded chromophore molecules, with oligomers present in the radiation curable composition, the chromophores become incorporated into

the backbone of the radiation curable oligomer by way of covalent bonds, and ultimately in the cured coating.

As a general example for forming a colored oligomer for providing a radiation cured polymeric colored coating capable of identifying a telecommunications element, a polyol reactive dye containing hydroxy end groups covalently bonded to a chromophore molecule is provided, in addition to, or in place of, some or all of the typical hydrocarbon polyol that is reacted with an aliphatic polyisocyanate and endcapping monomers to form a typical acrylated urethane oligomer reaction product used in an radiation curable composition for coating optical fibers. Suitable polyol reactive dyes are marketed under the trademark Reactint™ by the Milliken Chemical Company. Those skilled in the art will now recognize that if a sufficient amount of a polyol reactive dye is reacted with aliphatic polyisocyanate, then the resulting acrylated urethane oligomer reaction product will be colored in accordance with the color of the chromophore molecules that are covalently bonded to the oligomer.

The colored, acrylated urethane oligomer may be applied directly to the cladding of the optical fiber as a colored radiation curable composition to form the inner coating **16** or it may be applied directly over a previously applied inner coating as the outer coating **18**. Those skilled in the art will recognize that the colored oligomer may also be applied over a previously applied outer coating as a tertiary coating **20**, which is illustrated in FIG. 1B. Alternatively, and more commercially advantageous, the colored oligomer may be blended or diluted with a commercially available radiation curable composition typically formulated to provide a protective coating on the optical fiber to form a colored radiation curable composition which is applied over the cladding **14**, the inner coating **16** or the outer coating **18** of the optical fiber. Such radiation curable composition may include one or more uncolored aliphatic urethane acrylate oligomers, a reactive diluent, one or more photo-initiators and organofunctional silane adhesion promoters. In other words, the colored radiation curable oligomer described

herein may be added, in a quantity sufficient to impart color, to a commercially known, standard, uncolored, radiation curable composition used to provide a protective coating over an optical fiber.

After the radiation curable composition containing the colored oligomer is cured (polymerized) by exposure to radiation of a suitable wavelength and intensity for a suitable period of time, the resulting polymeric coating applied on the cladding **14**, the inner **16** or the outer **18** coating of the optical fiber **10**, contains chromophore molecules which are covalently bonded thereto. Because the chromophore molecules are covalently bonded to the polymeric coating, the risk of color loss due to bleeding is negligible. Thus, the manufacturing advantages that a dye provides over pigments, particularly application and curing speed, can be obtained while avoiding the bleeding disadvantages that a dye which is not covalently bonded to the polymeric coating may have when used in an optical fiber environment.

To provide a further detailed description of the invention, several examples are provided. Several synthesis examples for forming colored radiation curable oligomers suitable for use in a radiation curable oligomeric liquid composition for coating optical fibers and for forming optical fiber ribbon matrices are provided hereinafter. Examples of radiation curable oligomeric liquid compositions containing the colored oligomers are also provided.

Example 1 - Yellow Oligomer

202.89g of Milliken Reactint™ dye yellow X15 was added dropwise to a mixture of 67.44g isophorone diisocyanate (IPDI) and dibutyltin dilaurate that had been heated to 40°C. Care was taken that the exothermic reaction did not heat above 45°C by controlling the addition rate. The total time taken for addition was two hours. After the last addition of IPDI, 200g of 1,6 hexanediol diacrylate (HDODA) was added as a reactive diluent to lower viscosity along with 4.4g of inhibitor 2,6-Di-*tert*-butyl-4-methylphenol. This mixture was maintained at 40°C

for two hours before addition of 35.24g 2-hydroxyethyl acrylate (HEA) dropwise with the temperature maintained below 50°C by controlling the rate of addition of HEA. One hour after addition, there was no detectible isocyanate peak at 2270 cm^{-1} as observed by FTIR. The resulting urethane acrylate oligomeric reaction product has a yellow color.

Example 2 - Blue Oligomer

152.09g of Milliken Reactint™ dye blue X3LV was added dropwise to a mixture of 101.13g isophorone diisocyanate (IPDI) and 2.98g dibutyltin dilaurate that had been heated to 40°C. Care was taken that the exothermic reaction did not heat above 45°C by controlling the addition rate. The total time taken for addition was two hours. After the last addition of IPDI, 200g of 1,6 hexanediol diacrylate (HDODA) was added as a reactive diluent to lower viscosity along with 2.03g of inhibitor 2,6-Di-*tert*-butyl-4-methylphenol. This mixture was maintained at 40°C for two hours before addition of 52.96g 2-hydroxyethyl acrylate (HEA) dropwise with the temperature maintained below 50°C by controlling the rate of addition of HEA. Two hours after addition, there was no detectible isocyanate peak at 2270 cm^{-1} as observed by FTIR. The resulting urethane acrylate oligomer reaction product has a blue color.

Example 3 - Black Oligomer

226.67g of Milliken Reactint™ dye black X95AB was added dropwise to a mixture of 93.30g isophorone diisocyanate (IPDI) and 2.74g dibutyltin dilaurate that had been heated to 40°C. Care was taken that the exothermic reaction did not heat above 45°C by controlling the addition rate. The total time taken for addition was about two hours. After the last addition of IPDI, 200g of tetrahydrafuran (THF) solvent was added as a reactive diluent to lower viscosity along with 2.38g of inhibitor 2,6-Di-*tert*-butyl-4-methylphenol. This mixture was maintained at 40°C for two hours before addition of 48.78g 2-hydroxyethyl acrylate (HEA)

dropwise with the temperature maintained below 50°C by controlling the rate of addition of HEA. Two hours after addition, there was no detectible isocyanate peak at 2270 cm^{-1} as observed by FTIR. The THF solvent was then removed via rotovap vacuum technique at room temperature over a 10-hour period until a weight equal to the original inputs (minus the solvent) was reached. The resulting urethane acrylate oligomer reaction product has a black color.

Several liquid coating compositions employing the colored radiation curable oligomers are described hereinafter.

Example 4 - Yellow Colored Optical Fiber Outer Coating Composition

A yellow ultraviolet radiation curable coating composition for providing a colored outer coating was made by combining 60 weight percent Ebecryl™ 4827, which is an aromatic urethane diacrylate oligomer having a molecular weight of about 1500 sold by UCB Chemicals, 30 weight percent trimethylolpropane trimethacrylate (TMPTA) sold by UCB Chemicals, which is a reactive diluent, 6 weight percent of the yellow colored urethane acrylate oligomer reaction product of the synthesis described in Example 1 and about 4 weight percent of Darocure™ 4268 which is a photo-initiator. The coating composition was applied on an inner coating layer and cured by exposing the composition to ultraviolet radiation in a suitable wavelength range and intensity to form a yellow colored outer protective polymeric coating.

Example 5 - Blue Colored Optical Fiber Inner Coating Composition

A blue ultraviolet radiation curable coating composition for providing a colored inner coating was made by combining 60 weight percent Ebecryl™ 230, which is a high molecular weight aliphatic urethane diacrylate oligomer (bulk oligomer) sold by UCB Chemicals, 29 weight percent beta-carboxyethyl acrylate (β-CEA) sold by UCB Chemicals, which is a monofunctional reactive diluent, 6 weight percent of the blue colored urethane acrylate oligomer reaction product of

the synthesis described in Example 2 and about 5 weight percent of Darocure™ 4265, which is a photo-initiator. The coating composition was applied on the cladding of an optical fiber and cured by exposure to ultraviolet radiation in a suitable wavelength range and intensity to form a blue colored inner protective coating.

Example 6 - Blue Colored Optical Fiber Outer Coating Composition

A blue ultraviolet radiation curable coating composition for providing a colored outer coating was made by combining 60 weight percent Ebecryl™ 4827 (bulk oligomer), 30 weight percent TMPTA (reactive diluent), 6 weight percent of the blue colored urethane acrylate oligomer reaction product of the synthesis described in Example 2 and about 4 weight percent of Darocure™ 4268. The coating composition was applied to the inner coating of an optical fiber to form a blue colored outer protective polymeric coating after curing by exposure to ultraviolet radiation in a suitable wavelength range.

Example 7 - Blue Colored Ink (Tertiary) Coating Composition

A blue ultraviolet radiation curable coating composition for providing a colored tertiary coating was made by combining 25 weight percent Ebecryl™ 4866, which is an aliphatic urethane triacrylate diluted with 30 weight percent tripropylene glycol diacrylate (TRPGDA) sold by UCB Chemicals, 25 weight percent TMPTA (a reactive diluent), 35 weight percent of the blue colored urethane acrylate oligomer reaction product of the synthesis described in Example 2, 10 weight percent hexanediol diacrylate (HDODA) (a reactive diluent) and about 5 weight percent of Darocure™ 4268. The coating composition was applied over the outer coating of an optical fiber and cured by exposure to ultraviolet radiation in a suitable wavelength range to form a blue colored tertiary protective polymeric coating.

Example 8 - Blue Oligomer

11.16g of isophorone diisocyanate and 0.35g of dibutyltin dilaurate was heated to 50°C. 16.34g of 1,5-bis ((3-hydroxy-2,2-dimethylpropyl) amino)-9,10-anthracenedione was mixed with THF to get the anthracenedione into solution and added slowly to the reaction. The reaction temperature was maintained at 50°C for three hours. The temperature was reduced to 40°C and 0.25g of 2,6-Di-*tert*-butyl-4-methylphenol and 30g of 1,6 hexanediol diacrylate was added to the reaction. 5.819g of 2-hydroxyethyl acrylate was then added dropwise. The reaction was run to completion by measuring the isocyanate peak at 2270 cm^{-1} by FTIR. The THF was evaporated off of the mixture. The resulting urethane acrylate oligomer was blue in color.

Example 9 - Blue Colored Optical Fiber Outer Coating

A blue ultraviolet radiation curable coating composition for providing a colored outer coating was made by combining 65 weight percent of Ebercryl™ 4827, which is a urethane acrylate oligomer (bulk oligomer), 30 weight percent tripropylene glycol diacrylate (TPGDA), which is a reactive diluent, 1 percent of the blue colored urethane acrylate oligomer reaction product of the synthesis described in Example 8 and about 4 percent of Darocure 4268 which is a photo-initiator. The coating composition was applied to an inner coating layer and cured by exposing the composition to ultraviolet radiation at a suitable wavelength range to form a blue colored outer protective polymeric coating.

Example 10 - Blue Colored Optical Fiber Inner Coating

A blue ultraviolet radiation curable coating composition for providing a colored inner coating was made by combining 65 weight percent of Ebercryl™ 230, which is a urethane acrylate oligomer, 29 weight percent β-CEA monofunctional reactive diluent, 1 percent of the blue colored urethane acrylate oligomer reaction product of the synthesis described in Example 8 and about 5

weight percent Darocure 4265, which is a photo-initiator. The coating composition was applied to the cladding of an optical fiber and cured by exposure to ultraviolet radiation in a suitable wavelength range to form a blue colored inner protective fiber coating.

Colored Optical Fiber Ribbon

Referring to FIG. 2, there is shown a typical splittable optical fiber ribbon **22** containing two planar arrays **24a, 24b** of optical fibers **21**. Each of the arrays of optical fibers are enveloped by a primary matrix **26a, 26b** that hold the fiber arrays together. Both primary matrices **26a, 26b** are enveloped by a secondary matrix **28**. The primary matrices **26a, 26b**, the secondary matrix **28** or both may be colored in accordance with the present invention. An example of a colored matrix is described below.

Example 11 - Blue Ribbon Matrix

A composition for forming a blue colored optical fiber ribbon matrix was made by combining 6 weight of the blue oligomer described in Example 2, 60 weight percent Ebecryl™ 4866 trifunctional oligomer (bulk oligomer), 30 weight percent TMPTA (reactive diluent) and 4 weight percent Darocure™ 4268 photo-initiator. The resulting composition was applied over a planar array of optical fibers using ordinary application methods with a die or an applicator. The composition was cured by exposure to ultraviolet radiation in a suitable wavelength range to form a blue colored matrix over the planar array of optical fibers.

As shown above, the present invention provides a durable color identifying coating for a telecommunication element such as an optical fiber or an optical fiber ribbon. The embodiments disclosed herein admirably achieve the objects of the present invention; however, it should be appreciated by those skilled in the art that

departures can be made by those skilled in the art without departing from the spirit and scope of the invention which is limited only by the following claims.

WHAT IS CLAIMED IS:

1. A telecommunication element having a color identifying coating thereon, the telecommunication element comprising:

an elongated communication transmission medium; and

a radiation cured polymeric coating having an identifying color applied on at least a portion of the transmission medium, wherein the identifying color in the polymeric coating is provided by at least one chromophore molecule covalently bonded thereto.

2. The communications element of claim 1, wherein the elongated transmission medium is an optical fiber having a core and a cladding surrounding the core.

3. The communications element of claim 1, wherein the elongated transmission medium is an optical fiber having a core, a cladding surrounding the core and a polymeric coating on the cladding.

4. The communications element of claim 1, wherein the elongated transmission medium is an optical fiber having a core, a cladding surrounding the core, an inner polymeric coating on the cladding and an outer polymeric coating on the inner polymeric coating.

5. The communications element of claim 1, wherein the elongated transmission medium is a plurality of optical fibers arranged in an array.

6. A colored, radiation curable coating composition for providing a telecommunication element with a color identifying polymeric coating having

chromophore molecules covalently bonded thereto, the coating composition comprising:

a radiation curable composition capable of forming a polymeric coating; and

a colored oligomer having chromophore molecules covalently bonded thereto and wherein the colored oligomer is capable of covalent bonding with the radiation curable composition.

7. The composition of claim 6, wherein the colored oligomer comprises approximately 0.1 to 60 weight percent of the colored coating composition.

8. The coating composition of claim 6, wherein the radiation curable composition includes an aliphatic urethane acrylate component.

9. The coating composition of claim 8, wherein the radiation curable composition further includes a reactive diluent component.

10. The coating composition of claim 9, wherein the reactive diluent component comprises up to 30 weight percent of the radiation curable composition.

11. The coating composition of claim 8, wherein the radiation curable composition further includes a photo-initiator.

12. The coating composition of claim 11, wherein the photo-initiator comprises up to 10 weight percent of the radiation curable composition.

13. A method for producing a color identifying polymeric coating having chromophore molecules covalently bonded thereto on at least a portion of a

transmission medium of a telecommunication element, the method comprising the steps of:

providing a transmission medium;

providing a colored, radiation curable coating composition comprising:

a radiation curable composition capable of forming a polymeric coating; and

a colored oligomer having chromophore molecules covalently bonded thereto and wherein the colored oligomer is capable of covalent bonding with the radiation curable composition;

applying the coating composition to at least a portion of the transmission medium; and

exposing the applied coating composition for a suitable period of time to radiation of a suitable wavelength and intensity to cause curing of the composition into the color identifying polymeric coating.

14. The method of claim 13, wherein the colored oligomer comprises approximately 0.1 to 60 weight percent of the colored coating composition.

15. The method of claim 13, wherein the radiation curable composition includes an aliphatic urethane acrylate component.

16. The method of claim 15, wherein the radiation curable composition further includes a reactive diluent component.

17. The method of claim 16, wherein the reactive diluent component comprises up to 30 weight percent of the radiation curable composition.

18. The method of claim 15, wherein the radiation curable composition further includes a photo-initiator.

19. The method of claim 18, wherein the photo-initiator comprises up to 10 weight percent of the radiation curable composition.

20. The method of claim 13, wherein the elongated transmission medium is an optical fiber.

21. The communications element of claim 13, wherein the elongated transmission medium is an optical fiber having a core and a cladding surrounding the core.

22. The communications element of claim 13, wherein the elongated transmission medium is an optical fiber having a core, a cladding surrounding the core and a polymeric coating on the cladding.

23. The communications element of claim 13, wherein the elongated transmission medium is an optical fiber having a core, a cladding surrounding the core, an inner polymeric coating on the cladding and an outer polymeric coating on the inner polymeric coating.

24. The communications element of claim 13, wherein the elongated transmission medium is a plurality of optical fibers arranged in an array.

ABSTRACT OF THE DISCLOSURE

A telecommunication element having a durable color identifying polymeric coating thereon is disclosed. The telecommunication element comprises an elongated communication transmission medium, such as an optical fiber or an optical fiber ribbon, and a radiation cured polymeric coating having an identifying color applied on at least a portion of the transmission medium. The identifying color in the polymeric coating is provided by chromophore molecules that are covalently bonded thereto. Coating compositions and a method are also disclosed.

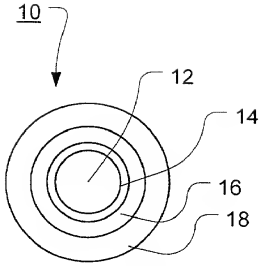

FIG. 1A

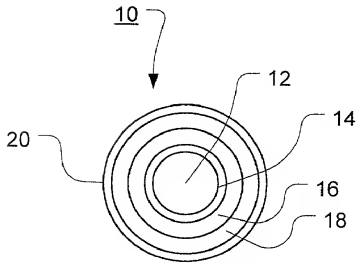

FIG. 1B

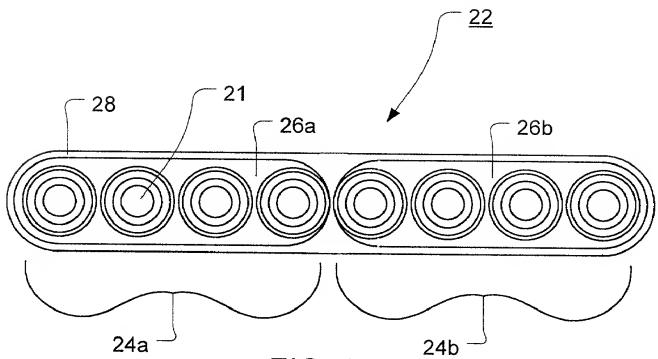

FIG. 2